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(56) Documents Cited

GB 2286941 A

GB 2261792 A

EP 0081767 A2

US 4716438 A

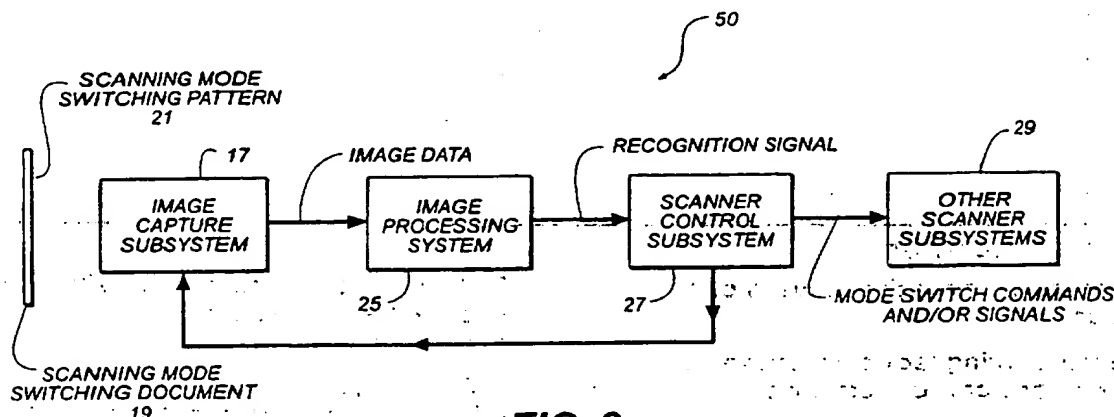
(58) Field of Search

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INT CL⁷ G03G 15/00, H04N 1/04 1/40 1/64
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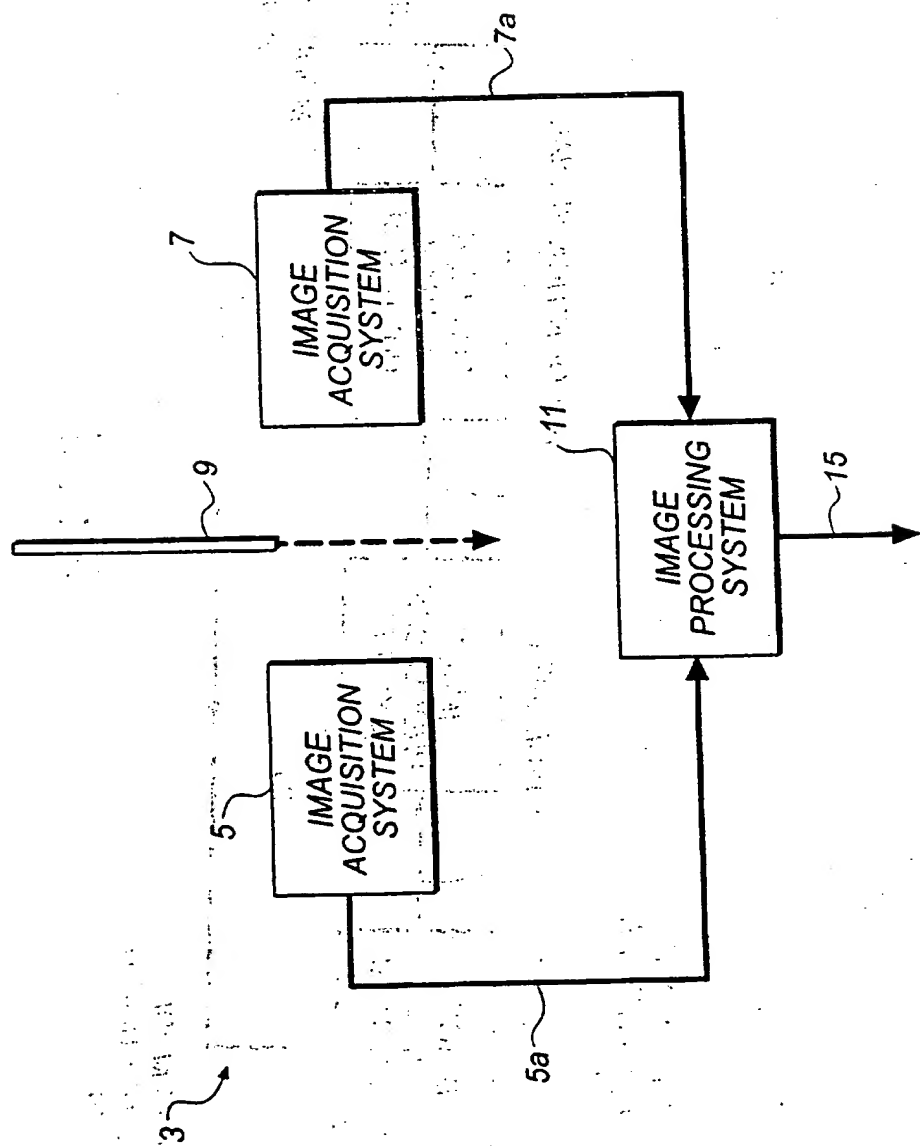
(54) Abstract Title

Image capture device capable of automatic switching between scanning modes

(57) A system and method in which an image capture device such as a document scanner can be automatically switched between a plurality of scanning modes while documents are being scanned. No manual intervention is required. In one implementation of the present invention the scanner can automatically toggle between two different scanning modes each time a predetermined switching pattern is detected. Scanning mode switching documents, each containing the switching pattern, can be inserted into a stack of sheets of a jobstream so as to separate batches with different scanning mode requirements. One of the scanning modes could be 'monochrome' and the other could be 'colour'. In an alternative implementation of the invention the scanning mode switching pattern can comprise information on the type of scanning to be performed and the image capture device can detect this information and change the scanning mode to the mode indicated by the switching pattern.

**FIG. 2**

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**FIG. 1**

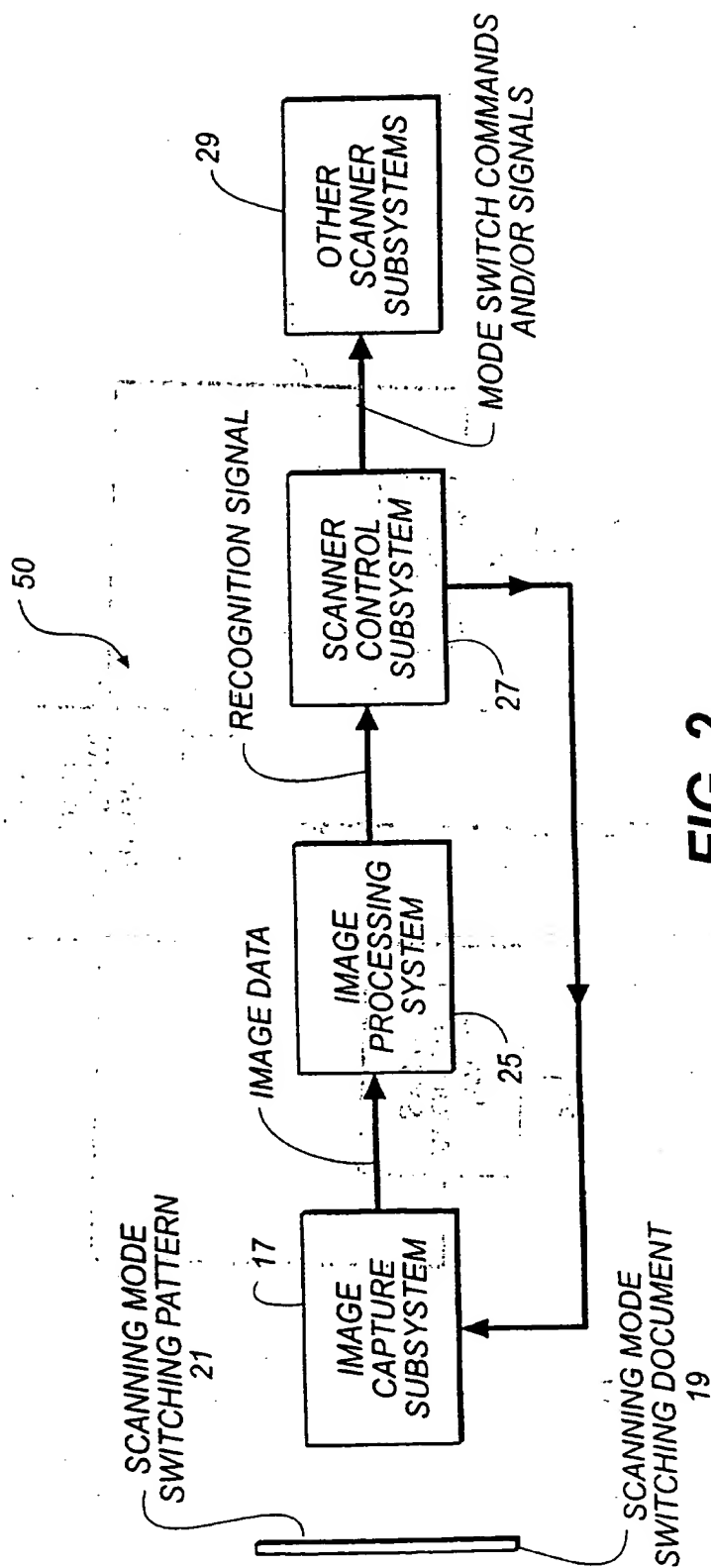


FIG. 2

APPARATUS FOR COLOR IMAGE PROCESSING AND MONOCHROME IMAGE PROCESSING

The present invention relates to a color image processing apparatus and a monochrome image processing apparatus. The color image processing apparatus is adapted to process a color image and a monochrome image. The monochrome image processing apparatus is adapted to process a monochrome image.

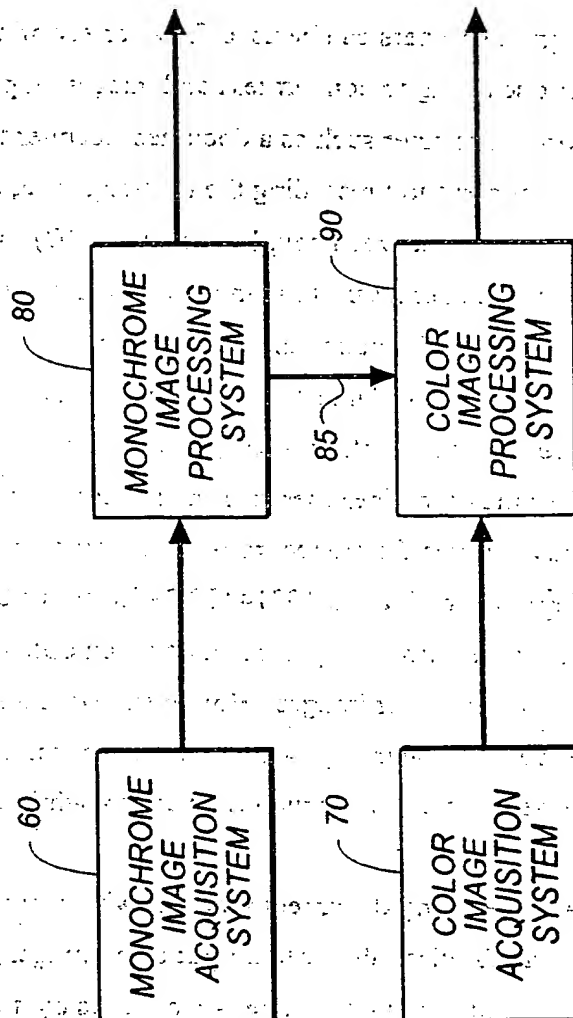
The color image processing apparatus includes a color image acquisition system, a color image processing system, and a color image output system. The monochrome image processing apparatus includes a monochrome image acquisition system, a monochrome image processing system, and a monochrome image output system.

The color image processing system is adapted to process a color image and a monochrome image. The monochrome image processing system is adapted to process a monochrome image. The color image processing system and the monochrome image processing system are connected to each other.

The color image processing system and the monochrome image processing system are connected to each other. The color image processing system is adapted to process a color image and a monochrome image. The monochrome image processing system is adapted to process a monochrome image.

The color image processing system and the monochrome image processing system are connected to each other. The color image processing system is adapted to process a color image and a monochrome image. The monochrome image processing system is adapted to process a monochrome image.

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**FIG. 3**

**AN IMAGE CAPTURE DEVICE HAVING A SCANNING MODE
SWITCHING AND OR TOGGLE CAPABILITY**

FIELD OF THE INVENTION

The present invention relates generally to an image capture device
5 such as a scanner, and in particular to document scanners which can automatically
switch and/or toggle between different scanning modes.

BACKGROUND OF THE INVENTION

Digital scanners can be used for a variety of applications, one of
which is document scanning to convert text and images on paper documents into
10 digital information. A scanner such as a document scanner typically works by
illuminating the document and recording the resulting image using a camera,
which typically includes a charged coupled device (CCD) as the image sensor.

It is often necessary to scan a variety of documents, some of which
contain significant color information and some of which contain primarily text in
15 typically black or blue ink. In large operations, it is possible that a user may have
to scan a first series of documents in a color scanning mode having specific color
scanning characteristics and a next series of documents in a monochrome
scanning mode having specific monochrome scanning characteristics.

German application 19914405.2 discloses a scanner which uses
20 both fixed and movable mirrors to provide a common optical path to capture
monochrome images and color images. However, existing scanners do not
provide for a method and means by which a document scanner can automatically
change or toggle between scanning modes on the fly while documents are being
scanned.

25 Also, existing document scanners with monochrome (black and
white) and color capabilities (ability to output color images) require that the
scanner be stopped and then switched between modes by a command issued by a
host computer which is initiated by an operator. This causes a decrease in
scanning productivity because this mode switching method takes time during
30 which scanning of documents is not occurring. One common strategy for
minimizing this scanning productivity decrease is to batch documents depending

on whether they are to be scanned in color or in black and white. However, it can still take a significant period of time to execute the mode switch.

It is known that pattern recognition on documents can be utilized to control scanning modes in microfilm scanning. However, in implementations such as microfilm scanning, the control relates to (1) the change of the scanning mode in one direction in which one pattern controls one change; and (2) the control of the document level or hierarchical file structure, as opposed to a bi-directional control of, for example, color and monochrome scanning.

SUMMARY OF THE INVENTION

10 The present invention provides for a unique method and apparatus for changing or toggling a scanning mode on the fly while documents are being scanned. The method and apparatus of the present invention utilizes pattern recognition to identify the type of scanning (scanning mode) to be performed. In pattern recognition, a unique pattern which is recognized by the scanner's image processing subsystem is placed on or included in a document to be scanned. Upon 15 recognition of the pattern, the document scanner automatically changes or toggles between scanning modes. For example, based on the recognized pattern, the document scanner can switch or toggle between a monochrome scanning mode and a color scanning mode.

20 With the scanning method and apparatus of the present invention, documents which are to be scanned in different modes do not have to be batched, so that the documents which are to be scanned in one mode are not necessarily batched together and separated from the documents which are to be scanned in a different mode. Additionally, if batched document scanning is desired, separate 25 batches of documents to be scanned in different modes can be effectively labeled as such in a form recognizable by the scanner. Thus the probability of operator error can be significantly reduced. Further, the method and apparatus of the present invention provides for the use of existing image capture and processing systems which obviates the need for additional hardware, and therefore minimizes 30 system cost.

The present invention relates to an image capture device comprising an image processing system which processes data supplied thereto to

determine if the data includes a scanning mode switching pattern, with the image processing system providing a scanning mode switching signal upon a detection of the scanning mode switching pattern; and a control system which receives the scanning mode switching signal and toggles a scanning mode of the image capture device between at least a first scanning mode and a second scanning mode when the scanning mode switching pattern is detected.

The present invention also relates to a scanning method which comprises the steps of processing data inputted to a scanner to detect a scanning mode switching pattern; and toggling a scanning mode of the scanner between at least a first scanning mode and a second scanning mode when the scanning mode switching pattern is detected.

The present invention also relates to an image capture device that comprises an image processing system which processes data supplied thereto to determine if the data includes a scanning mode switching pattern. The image processing system provides a scanning mode switching signal upon a detection of the scanning mode switching pattern. The scanning mode switching pattern comprises information on the type of scanning to be performed on an image to be scanned. The image capture device further comprises a control system that receives the scanning mode switching signal and switches a scanning mode of the image capture device based on the information on the scanning mode switching pattern.

The present invention further relates to a scanning method that comprises the steps of processing data inputted into a scanner to detect a scanning mode switching pattern, and recognize information on the scanning mode switching pattern indicative of the type of scanning to be performed on an image to be scanned; and switching a scanning mode of the scanner when the scanning mode switching pattern is detected. The scanning mode of the scanner is switched in accordance with the information on the scanning mode switching pattern indicative of the type of scanning to be performed on the image to be scanned.

The present invention further relates to a scanning mode switching device for an image capture assembly. The scanning mode switching device comprises an image processing system which processes data supplied thereto to

determine if the data includes scanning mode switching information, and provides a switching signal upon a detection of the scanning mode switching information; and a control system which receives the switching signal and switches a scanning mode of the image capture device based on the scanning mode switching information.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a schematic illustration of an image capture device such as a scanner which is capable of, for example, color scanning and monochrome scanning in accordance with the present invention;

Figure 2 is a schematic illustration of the scanner of Figure 1 including the specific scanning mode switching implementation in accordance with the present invention; and

Figure 3 is a schematic illustration of a further embodiment of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, wherein like reference numerals represent identical or corresponding parts throughout the several views, Figure 1 schematically illustrates an image capture device such as a scanner 3 which can perform color scanning and monochrome scanning on an image or document to be scanned.

As illustrated in Figure 1, scanner 3 can include an image acquisition system 5 which can be a color scanning subsystem that includes a color CCD; and an image acquisition system 7 which can be a monochrome scanning subsystem that includes a monochrome CCD. Scanner 3 as well as image acquisition systems 5 and 7 as illustrated in Fig. 1 can take the form of the scanner illustrated in German application No. 19914405.2. Although two image acquisition systems 5 and 7 are illustrated, the present invention is not limited thereto. It is recognized that based on design considerations, more than two image acquisition systems can be used, with each image acquisition system pertaining to different scanning characteristics such as speed, resolution, color, monochrome, ect.

As illustrated in Fig. 1, a document to be scanned 9 can be conveyed between image acquisition systems 5 and 7. Images can be selectively acquired via acquisition systems 5 and 7, and conveyed to a processing system 11 via lines 5a and 7a. That is, with the system as illustrated in Figure 1, document 9 is scanned to convert text and images on the document into digital information which is passed to image processing system 11 through lines 5a and 7a. The information is thereby processed in image processing system 11 and converted into an image output 15 in a known manner.

In many instances, it is desired to scan a plurality of documents in a jobstream in which one type of scanning such as color scanning is to be performed on certain documents, and another type of scanning such as monochrome scanning is to be performed on other documents. In order to expedite this procedure, it is desirable but not necessary that the documents which are to be subjected to, for example, color scanning be batched together, and that the documents which are to be subjected to, for example, monochrome scanning be batched together. The present invention provides for the automatic switching or toggling of scanner 3 between at least a first scanning mode such as a color scanning mode, and a second scanning mode such as a monochrome scanning during the scanning process itself.

In one embodiment of the present invention, a user can dynamically switch or toggle between one scanning mode and another scanning mode by inserting a scanning mode switching/toggle document which includes a scanning mode switching/toggle pattern in predetermined locations in the jobstream. For example, a user can dynamically switch or toggle between a monochrome scanning mode and a color scanning mode by inserting a scanning mode switching/toggle document which includes a scanning mode switching/toggle pattern in predetermined locations in the jobstream. It is noted that the present invention is not limited to switching and/or toggling between color and monochrome and that the present invention can also switch and/or toggle between different scanning mode characteristics such as speed, resolution, compression algorithms, etc.

Reference is now made to Figure 2 which schematically illustrates an embodiment of an image capture device such as a scanner 50 in accordance with the present invention. The embodiment of Figure 2 will be described with reference to switching/toggling between color and monochrome scanning modes as an example. However, as discussed above, the present invention is not limited thereto and can switch/toggle between numerous scanning modes based on design considerations. As illustrated in Figure 2, image acquisition systems 5 and 7 which can include both color cameras and monochrome cameras are represented by image capture subsystem 17. During use of scanner 50, a user conveys an instructional document in the form of a scanning mode switching document 19 which includes a scanning mode switching pattern 21 thereon pass image capture subsystem 17. The instructional document is associated with a batch of documents to be scanned. Scanning mode switching pattern 21 includes information on whether, for example, color or monochrome scanning is to be performed on the batch of documents that follow document 19 having scanning mode switching pattern 21 thereon. More specifically, image capture subsystem 17 will acquire digital data representing scanning mode switching pattern 21 and pass this data to an image processing system 25. Image processing system 25 processes and decodes the data to determine if a switching pattern is present and recognize instructions which are to be performed in response to the switching pattern. Upon pattern recognition, a recognition signal is generated to a scanner control subsystem 27 such as a central processing unit (CPU). Upon receipt of the recognition signal, scanner control subsystem 27 controls image capture subsystem 17 as well as other scanner subsystems 29 to execute a mode switch or toggle operation in accordance with the instructions on scanning mode switching pattern 21. When the mode switch is complete, scanner control subsystem 27 resumes scanning. All of the above can be done without any operator intervention.

Therefore, with the embodiment of the present invention as described above, a first batch of documents can follow a document 19 with a scanning mode switching pattern 21 thereon which instructs the scanner to perform color scanning on the first batch. As document 19 passes image capture

subsystem 17, data from scanning mode switching pattern 21 is passed to image processing system 25 which detects switching pattern 21 and recognizes the instruction to perform color scanning on the first batch of documents which follow document 19. That is, a recognition signal will be given to scanner control subsystem 27 which will provide a mode switching signal to image capture subsystem 17 and scanner subsystem 29 to perform a color scanning on documents in the first batch which follow document 19. After color scanning is performed, a second batch of documents can follow a second document 19 with a switching pattern 21 thereon that instructs the scanner to perform monochrome scanning. Once image capture subsystem 17 conveys the data to image processing system 25, image processing system 25 detects and recognizes the instructions from switching pattern 21 to perform monochrome scanning. Image processing system 25 and scanner control system 27 then provide instructions to image capture subsystem 17 and scanner subsystem 29 to perform monochrome scanning.

In a preferred embodiment of the system and method of the present invention, scanner 50 can dynamically toggle between first and second scanning modes using one switching pattern 21. That is, an instructional document with a switching pattern 21 can be positioned at predetermined positions in a jobstream, and every time the image capture subsystem 17 and image processing system 25 recognizes the presence of switching pattern 21, the scanner automatically toggles from the scanning mode in which it is presently in (for example, the first scanning mode) to the second scanning mode. When image capture subsystem 17 and image processing system 25 recognizes the next instructional document 19 and switching pattern 21 in the jobstream, the scanner will toggle back to the first scanning mode. In this embodiment, the scanner automatically toggles back and forth between scanning modes every time a switching pattern 21 is detected.

In a further feature, it is noted that the present invention is not limited to toggling between first and second scanning modes. For example, the system of the present invention can be adapted to provide for multiple scanner parameters to which the scanner can be changed. Thus, with the system of the present invention, it is possible for the scanner to first change from color to black

and white, and thereafter change speed, resolution, compression algorithms, etc., based on the information on the detected switching pattern 21.

Therefore, with the system and method of the present invention, a user can automatically switch and/or toggle back and forth between, for example, a monochrome scanning mode and a color scanning mode in a jobstream by inserting a document 19 with a switching pattern 21 thereon into specific locations of the jobstream. Image capture system 17 and image processing system 25 continuously monitors the inputted data for data representing an instruction to resort to a specific scanning mode. When image processing system 25 and scanner control subsystem 27 recognizes that there is to be a switch in the scanning mode, scanner control subsystem 27 can provide instructions to a document feeder to stop a feeding of documents and make the switch before the feeding of the documents that follows document 19.

Of course, it is recognized that as an alternative, switching pattern 21 can be placed directly on documents to be scanned as opposed to on an instructional document as described above. Additionally, as previously noted, it is recognized that the present invention can provide switching mode instructions for controlling other attributes of the scanner other than monochrome and color scanning. For example, switching pattern 21 could include scanner characteristics instructions with respect to resolution, compression, etc., and control the scanning mode accordingly.

With respect to scanning mode switching pattern 21, this could be in the form of a series of black lines similar to a patch or other discrete and known shapes in fixed patterns. For example, a first unique pattern can be used for color scanning, and a second unique pattern can be used for monochrome scanning. As a further example, a single pattern can be used to trigger a toggling between a variety of scanning modes.

Figure 3 illustrates a further embodiment of the present invention. Figure 3 shows a monochrome image acquisition system 60, which conveys the data it acquires to a monochrome image processing system 80, and a color image acquisition system 70, which conveys the data it acquires to a color image processing system 90. The combination of both image processing systems is

equivalent to the image processing system 25 described in Figure 2. In such an image processing system where color and monochrome processing is separate, it is desirable to include pattern detection circuitry in one location. This necessitates the addition of a path 85 between both image processing subsystems as shown in Figure 3. This approach enables a net savings in hardware and additionally allows only one image acquisition system to be active at any given time to assure capture of the pattern to be detected. Otherwise, both acquisition systems would have to be enabled simultaneously.

With the method and system of the present invention, it is possible to automatically switch or toggle between scanning modes on the fly while documents are being scanned. This provides for an increase in scanner productivity especially when batches of documents in which, for example, color scanning and monochrome scanning is to be performed is fed to a scanner.

CLAIMS:

1. An image capture device comprising:
an image processing system which processes data supplied thereto to determine if the data includes a scanning mode switching pattern, said image processing system providing a scanning mode switching signal upon a detection of said scanning mode switching pattern; and
a control system which receives said scanning mode switching signal and toggles a scanning mode of said image capture device between at least a first scanning mode and a second scanning mode when the scanning mode switching pattern is detected.

2. An image capture device according to claim 1, wherein said first scanning mode and said second scanning mode relate to scanner characteristics with respect to at least color scanning, monochrome scanning, scanner speed, scanner resolution, and scanner compression algorithms.

3. An image capture device according to claim 1, wherein said scanning mode switching pattern is located on a document to be scanned.

4. An image capture device according to claim 1, wherein said scanning mode switching pattern is located on a scanning mode switching document which is associated with a stack of documents to be scanned.

5. A scanning method comprising the steps of:
processing data inputted to a scanner to detect a scanning mode switching pattern;
toggling a scanning mode of the scanner between at least a first scanning mode and a second scanning mode when the scanning mode switching pattern is detected.

6. A method according to claim 5, wherein said first and scanning modes relate to scanner characteristics with respect to at least color scanning,

monochrome scanning, scanner speed, scanner resolution, and scanner compression algorithms.

7. A method according to claim 5, wherein said scanning mode switching pattern is located on a document to be scanned.

8. A method according to claim 5, wherein said scanning mode switching pattern is located on a scanning mode switching document which is associated with a stack of documents to be scanned.

9. An image capture device comprising:

an image processing system which processes data supplied thereto to determine if the data includes a scanning mode switching pattern, said image processing system providing a mode switching signal upon a detection of the scanning mode switching pattern, said scanning mode switching pattern comprising information on the type of scanning to be performed on an image to be scanned; and

a control system which receives said scanning mode switching signal and switches a scanning mode of said image capture device based on the information on the scanning mode switching pattern.

10. An image capture device according to claim 9, wherein said scanning mode switching pattern comprises color scanning mode information or monochrome scanning mode information, such that said control system switches said image capture device to a color scanning mode upon a detection of the color scanning mode information, and switches said image capture device to a monochrome scanning mode upon a detection of the monochrome scanning mode information.



INVESTOR IN PEOPLE

Application No: GB 0002914.0
Claims searched: 1-10

Examiner: John Cullen
Date of search: 7 September 2000

Patents Act 1977 Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK CI (Ed.R): H4F (FFC, FCA, FFF, FFX)

Int CI (Ed.7): G03G 15/00; H04N 1/04, 1/40, 1/64

Other: Online: WPI, EPODOC, JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
Y	GB 2286941 A (MATSUSHITA) See figures, lines 6-12 of p18 and lines 3-18 of p27.	1-10
Y	GB 2261792 A (RICOH) See entire document.	1-3, 5-7, 9 & 10
X	EP 0081767 A2 (TOKYO SHIBAURA) See figures, lines 14-22 of p3, lines 17-20 of p4, and line 29 of p8 to line 28 of p10. Control marks 4-8 can be regarded as 'switching patterns'.	1-3, 5-7 & 9
Y	US 4716438 (XEROX CORPORATION) See figures 4 and 5 and line 34 of col. 5 to line 51 of col. 6.	1-9

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

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